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**(54) Air conditioner for motor vehicles**

(57) An air conditioner for use in motor vehicles comprises a main body (1) having a configuration elongate in the transverse direction of a motor vehicle in which the air conditioner is to be installed, two blowers (3, 3) arranged at opposite ends of said main body (1), a heater core (8) arranged centrally of said main body (1) and extending parallel to the longitudinal axis thereof, two evaporator cores (9, 9) arranged between said heater core (8) and said blowers (3, 3) and two

air mixing doors (11, 11) arranged between said heater core (8) and said evaporator cores (9, 9). The evaporator cores (9, 9) may be disposed obliquely relative to the longitudinal axis of the main body (1) and symmetrically with respect to the heater core (8). A guide plate (12) may be provided for causing mixing of warm air and cool air streams which are controlled by the positions of the air mixing doors (11, 11). This arrangement provides a compact construction for the air conditioner which therefore does not greatly encroach upon the passenger compartment space, and allows an adequate refrigerating capacity as well as a high mixability of cool air and warm air.

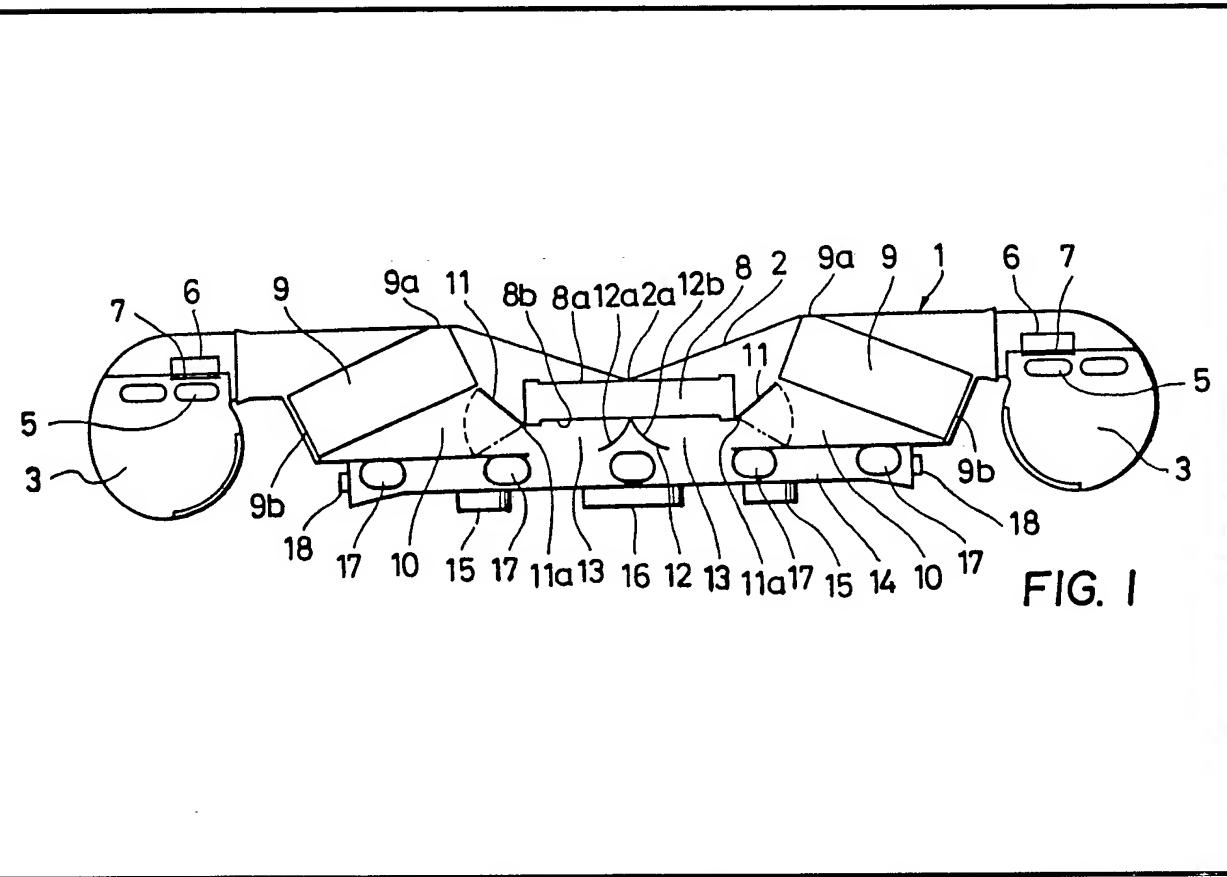
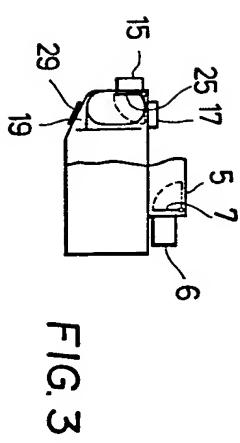
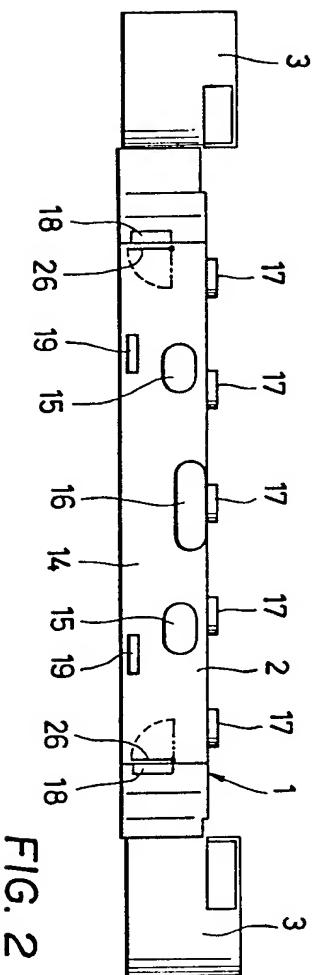
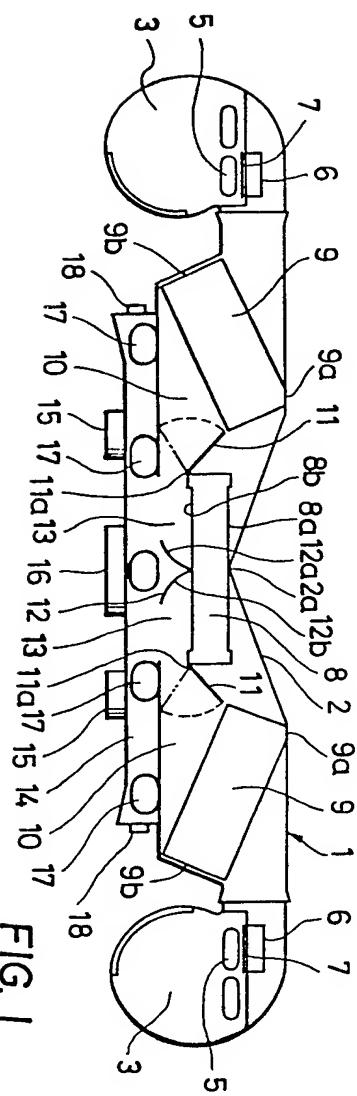


FIG. 1

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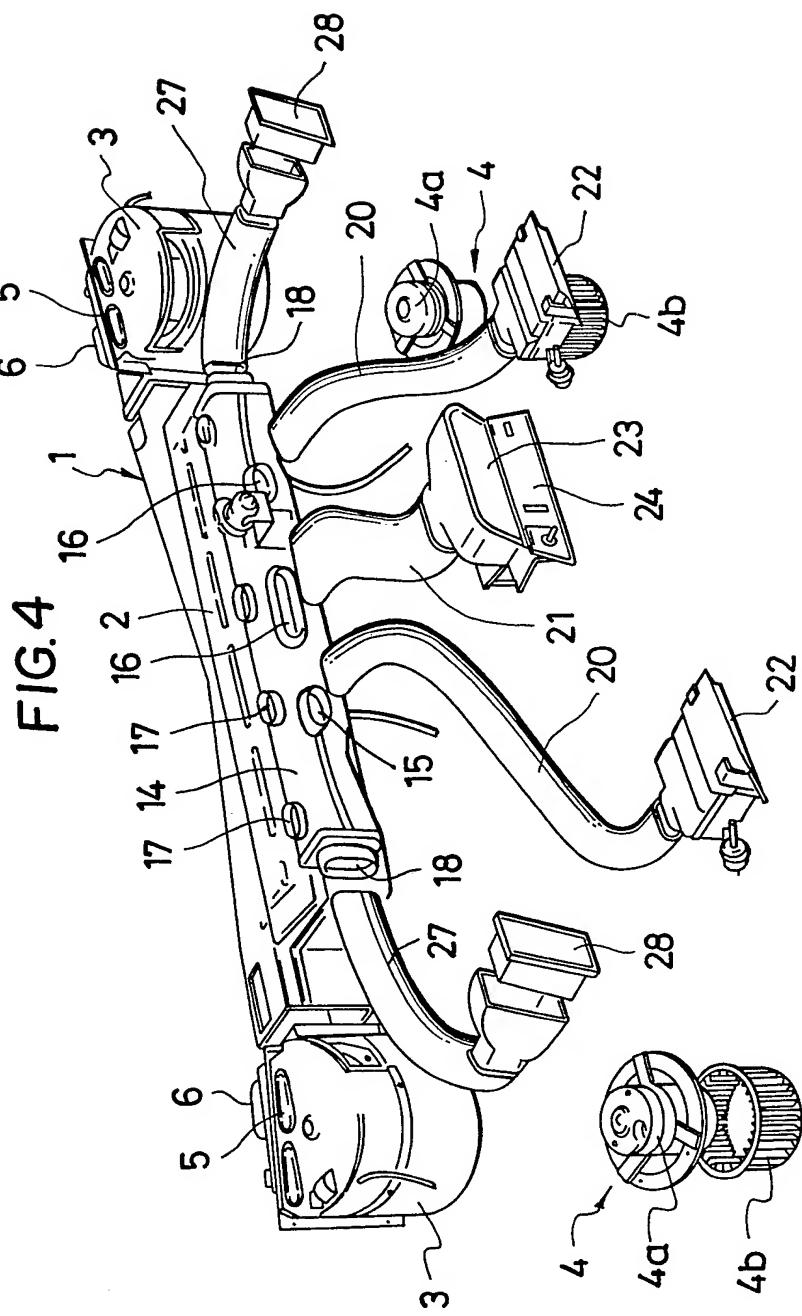
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## SPECIFICATION

## Air conditioner for motor vehicles

5 This invention relates to improvements in or to an air conditioner for use in motor vehicles. Motor vehicles, particularly sports cars in general, are designed such that the passenger compartments are rather small in space in

10 order to reduce the weights as well as the air resistance thereof. Therefore, when an air conditioner is installed in a motor vehicle, the passenger compartment is inevitably too small in space, which results in a low comfortableness. To solve this problem, the heater core, the evaporator core, etc. which constitute an air conditioner should be designed small in size, and these elements should be arranged at smaller intervals from each other such that

15 20 the whole construction of the air conditioner is compact in size. According to such compacted air conditioner, it has been recognized through experience that while the capacity of the heater core does not drop so much for its

25 reduced size, the capacity of the evaporator core drops by a large margin due to its reduced size. Thus, the compacted air conditioner can have a limited refrigerating capacity. Furthermore, if the heater core and the

30 35 evaporator core are arranged at a very small interval from each other, cold air and warm air are not mixed together to a sufficient extent when the air conditioner is in air-mix mode so that they are blown into the passenger compartment from the air conditioner in a separate state, which makes the passenger feel uncomfortable.

The invention is therefore intended to provide an air conditioner of a novel construction for use in motor vehicles, which permits the heater core and the evaporator core to be designed small in size and arranged at a small interval from each other, with no substantial drop in the capacity of these elements, and which also exhibits a very high mixability of cold air and warm air.

According to the invention, there is provided a car air conditioner of which the overall configuration is elongate in the transverse direction of a motor vehicle into which it is intended to be installed, and is accordingly small in width or breadth, to thereby prevent the passenger compartment of the vehicle from being narrow and uncomfortable to the passenger.

According to a preferred form of the invention, the air conditioner has a main body having an elongate and symmetrical configuration in which a heater core is arranged at a central portion thereof. A pair of evaporator cores are located on the opposite sides of the heater core. Further disposed on an outward side of each of said evaporator cores is a blower. Thus, refrigeration is performed by two evaporator cores, and accordingly a suffi-

cient refrigerating capacity can be provided even if the evaporator cores are designed small in size.

Furthermore, the heater core is arranged 70 parallel with the longitudinal axis of the main body of the air conditioner. The evaporator cores are disposed slightly obliquely relative to the longitudinal axis of said main body and symmetrically with respect to the heater core.

75 Two air mixing doors are provided on the opposite sides of the heater core which are pivotable about associated ends of the heater core to regulate the quantity of air passing through the heater core. Further defined in 80 front of the heater core are air mixing chambers to obtain an improved air mixability.

The invention is described in detail below with reference to drawings which illustrate only one specific embodiment, in which:

85 *Figure 1* is a top plan view of an air conditioner for motor vehicles in accordance with the invention,

*Figure 2* is a front view of the air conditioner,

90 *Figure 3* is a side view, partly broken away, of the air conditioner, and

*Figure 4* is an exploded view in perspective of the air conditioner.

The figures show an air conditioner for 95 motor vehicles in accordance with the invention. A main body 1, which is adapted to be mounted in the front portion of the passenger compartment of a car, not shown, has a generally elongate and longitudinally symmet-

100 rical configuration and is adapted to be mounted in the motor vehicle with its longitudinal axis directed in the transverse direction of the car. The main body 1 has a measure in its longitudinal direction, i.e., a length substantially equal to the width of the front portion of the passenger compartment of the vehicle.

A pair of blower casings 3, 3 are coupled to the opposite ends of an elongate casing 2 for 110 the main body 1. Each of said blower casings 3, 3 accommodates a blower 4 which comprises a motor 4a and a Silocco fan 4b rotatable together with the motor 4a, as shown in *Fig. 4*. The blower 4 aspirates air

115 through an inside air inlet 5 or an outside air inlet 6 both formed in the blower casing 3, and feeds the aspirated air toward a central portion of the main body casing 2 through an air passage 10 formed in the casing 2. An

120 inside air-outside air change-over door 7 is pivotally provided at a junction between the inside air inlet 5 and the outside air inlet 6, which is adapted to be pivoted to selectively allow inside air or outside air to be aspirated 125 into the blower 4.

Accommodated within the main body casing 2 are a heater core 8 and two evaporator cores 9, 9. The heater core 8, which serves to heat aspirated air, has an elongated configuration and is disposed at a central portion of the

main body casing 2 with its longitudinal axis directed in the longitudinal direction of the casing 2 in a fashion that the heater core 8 has a lateral surface (air inlet side) 8a disposed in contact with an inner surface of a depression 2a formed centrally in the rear wall of the casing 2.

The evaporator cores 9, 9, which serve to refrigerate aspirated air, are disposed near the opposite ends of the heater core 8 and also have an elongate configuration, with their longitudinal axes directed slightly obliquely relative to the longitudinal axis of the main body casing 1 in a fashion symmetrical with respect to the heater core 8. The evaporator cores 9, 9 each have a core 9a, which faces the heater core 8, placed in contact with an inner surface of the rear wall of the main body casing 2 and a corner 9b, which faces toward the associated blower 4, placed in contact with an inner surface of the front wall of the casing 2, thus traversing the air passages 10, 10 formed within the casing 2.

A pair of air mixing doors 11, 11 are provided at portions of the air passages 10, 10 between the heater core 8 and the evaporator cores 9, 9. These doors 11, 11 are adapted to make pivotal motion about fulcrums 11a, 11a provided on associated ends of the heater core 8 in unison with each other by means of a connection rod, not shown. These doors 11, 11 serve to vary, through their pivotal motion, the opening of the portions of the air passages 10, 10 between the heater core 8 and the evaporator cores 9, 9 to control the quantity of air passing through the cores 9, 9 and being delivered to the heater core 8 and accordingly adjust the ratio of cold air to warm air in the air being blown into the passenger compartment.

Mounted on a central portion of the lateral surface (air outlet side) 8b of the heater core 8 which faces the front wall of the main body casing 2 is an air flow guide plate 12 which has two wings 12a, 12b inclined at equal angles to said lateral surface of the heater core 8 in a fashion diverging from said lateral surface of the core 8. Thus, air mixing chambers 13, 13 are formed between the opposite sides of the guide plate 12 and the front side of the heater core 8. In these air mixing chambers 13, 13, refrigerated air from the evaporator cores 9, 9 and heated air from the heater core 8 collide with each other to mix together.

Provided on the front side of the main body casing 2 is an air outlet duct section 14 which slightly protrudes forwardly of the casing 2. The section 14 has various air outlets 15, 16, 17, 18, 19 formed in the surfaces thereof through which air is blown into the passenger compartment from the air mixing chambers 13, 13.

The face or front air outlets 15, 16 are formed in the front side wall of the section 14

and are connected with air grilles 22, 23 through joint ducts 20, 21. The air grilles 22, 23 may be located at desired places.

The air grille 23, which is adapted to be located at a center of the front portion of the passenger compartment, includes a control panel 24 mounted on a lower part thereof. Mode selection and change of the rotational speed of the blowers 4, 4, etc. can be effected by manipulation of the levers or other control elements mounted on the control panel 24.

The defrosting air outlets 17 are formed in the upper side surface of the duct section 14 for delivering air for prevention of frosting of the front glass of the vehicle. Hinged to a junction between the defrosting air outlets 17 and the face air outlets 15, 16 is a change-over door 25 which is pivotable to selectively allow the face outlets 15, 16 or the defrosting air outlets 17 to deliver air therethrough.

The side air outlets 18, 18 are formed in the opposite end faces of the air outlet duct section 14. Doors 26, 26 are pivotally hinged to the inner surfaces of the opposite ends of the section 14 for controlling the quantity of air being delivered through the outlets 18, 18. Joint ducts 27, 27 are connected at ends thereof with these outlets 18, 18 and are also connected at the other ends thereof with side air grilles 28, 28. The floor air outlets 19, 19 are formed in the underside surface of the air outlet duct 14. A heater door 29 is mounted on each of these floor air outlets 19, 19

which is adapted to open when the air conditioner is in heater mode, to allow air to be delivered through the outlet 19.

With such an arrangement, changeover of heater mode, cooler mode and defroster mode 105 can be carried out by selectively operating the change-over doors 7, 25, 26 and 29.

Description is made below about the temperature control operation of the air being blown from the air conditioner according to 110 the invention.

When the blowers 4, 4 are rotated, the blowers 4, 4 suck into the blower casings 3, 3 outside air or inside air in dependence on the position of the change-over doors 7, 7 115 and feed the sucked air into the air passages 10, 10 in the main body casing 2.

The air thus fed into the passages 10, 10 is cooled in passing through the evaporator cores 9, 9. The cool air fed from the evaporator cores 9, 9 are divided into two streams, one flowing to the rear side of the heater core (8) and the other flowing to the front side thereof, by adjusting the opening of the portions of the air passages 10, 10 between the heater core 8 and the evaporator cores 9, 9 so as to obtain a desired temperature of the air delivered from the air conditioner. The air stream flowing to the rear side of the heater core (8) is turned along the inner wall surface 125 of the casing 2 and forced to pass through 130 of the casing 2 and forced to pass through

the heater core 8 where it is heated. Then, the heated air is forced to collide with the guide plate 12 into two streams flowing to the left and to the right respectively. The left and right streams are then fed into the respective air mixing chambers 13, 13.

t In the air mixing chambers 13, 13, cool air from the evaporator cores 9, 9 and warm air from the heater core 8 which flow in the opposite directions collide with each other and accordingly are mixed together homogeneously. The resulting air mixture is delivered into the passenger compartment through the air outlets 15, 16 etc.

15 As stated above, according to the invention, the elongate configuration of the main body of the air conditioner enables to reduce the width thereof, which thus ensures sufficient space in the passenger compartment of the vehicle. Further, the use of two evaporator cores in an arrangement as mentioned above prevents a drop in the refrigerating capacity even if the evaporator cores are made compact in size. Still further, the arrangement that cool air and warm air are mixed together in a colliding manner in the air mixing chambers in front of the heater core provides a very high mixability of the cool air and the warm air, thus enabling to obtain a desired temperature in the passenger compartment.

#### CLAIMS

1. An air conditioner for use in a motor vehicle, comprising a main body, a blower means for selectively aspirating inside air and outside air and blowing the aspirated air into said main body, a heater means for heating air fed from said blower means; and a refrigerating means for refrigerating air fed from said blower means, wherein said main body has an elongate configuration for location with its longitudinal axis extending in a transverse direction of a motor vehicle in which the air conditioner is to be installed in use, said blower means comprising a pair of blowers arranged at the opposite ends of said main body, said heater means comprising a heater core arranged at a central portion of said main body and extending parallel with the longitudinal axis of said main body, said refrigerating means comprising a pair of evaporator cores each arranged between said heater core and each of said blowers, and there being provided a pair of air mixing doors each arranged between said heater core and each of said evaporator cores, said air mixing doors being each adapted to vary the opening of an air passage formed between said heater core and the associated evaporator core to control the quantity of air being fed to the heater core.
2. An air conditioner as claimed in claim 1, in which said main body has a configuration symmetrical in the longitudinal direction thereof.
3. An air conditioner as claimed in claim 1

or claim 2 in which said evaporator cores are disposed obliquely relative to the longitudinal axis of said main body and symmetrically with respect to the heater core.

4. An air conditioner as claimed in claim 1, 2 or 3 in which said air mixing doors are each arranged to divide air fed from an associated one of said evaporator cores into two streams which are guided to the rear side of said heater core and to the front side thereof respectively, said air streams guided to the rear side of the heater core being further guided to the front side of the heater core through the heater core.
5. An air conditioner as claimed in any of the preceding claims, in which said air mixing doors are arranged for pivotal motion about axes thereof provided at the opposite ends of said heater core.
6. An air conditioner as claimed in any of the preceding claims, including a guide plate arranged in front of said heater core to form air mixing chambers in front of said heater core wherein warm air from the heater core and cool air from said evaporator cores collide with each other to mix together.
7. An air conditioner as claimed in claim 6, in which said guide plate comprises two wings diverging from the front side wall of said heater core.
8. An air conditioner substantially as hereinbefore described with reference to, and as illustrated in, the accompanying drawings.
9. A motor vehicle having an air conditioner as claimed in any preceding claim.

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London, WC2A 1AY, from which copies may be obtained.

**DERWENT-ACC-NO:** 1980-M1768C**DERWENT-WEEK:** 198324*COPYRIGHT 2009 DERWENT INFORMATION LTD***TITLE:** Air conditioner for motor vehicle has blower at each end of main body with evaporator and heater cores**INVENTOR:** NAGAO T; YANO T**PATENT-ASSIGNEE:** DIESEL KIKI CO LTD[DIES]**PRIORITY-DATA:** 1978JP-178339 (December 28, 1978)**PATENT-FAMILY:**

| <b>PUB-NO</b> | <b>PUB-DATE</b>   | <b>LANGUAGE</b> |
|---------------|-------------------|-----------------|
| GB 2049159 A  | December 16, 1980 | EN              |
| GB 2049159 B  | June 15, 1983     | EN              |

**INT-CL-CURRENT:**

| <b>TYPE</b> | <b>IPC DATE</b>   |
|-------------|-------------------|
| CIPS        | B60H1/00 20060101 |

**ABSTRACTED-PUB-NO:** GB 2049159 A**BASIC-ABSTRACT:**

The air conditioner is for use in motor vehicles. It comprises a main body (1) elongate in the transverse direction of a motor vehicle, in which the air conditioner is to be installed. Two blowers (3, 3) are arranged at opposite ends of the main body. A heater core (8) is arranged centrally of the main body and extends parallel to the longitudinal axis. Two evaporator cores (9, 9) are arranged between the heater core (8) and the blowers.

Two air mixing doors (11, 11) are arranged between the heater core (8) and the evaporator cores (9, 9). The evaporator cores (9, 9) may be oblique relative to the longitudinal axis of the main body

and symmetrically with respect to the heater core.

**TITLE-TERMS:** AIR CONDITION MOTOR VEHICLE BLOW END MAIN BODY  
EVAPORATION HEATER CORE

**DERWENT-CLASS:** Q12